Ranch Systems LLC

RanchMaster System

Installation Guide

April 2010

(V5.01)

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Warranty Coverage.

Ranch Systems' warranty obligations are limited to the terms set forth below: Ranch Systems LLC ("RS") warrants hardware products manufactured and sold by RS against defects in materials and workmanship for a period of TWO (2) YEARS from the date of original purchase. If a defect exists, at its option RS will (1) repair the product at no charge, (2) exchange the product with a new product that is at least functionally equivalent to the original product, or (3) refund the purchase price of the product. A replacement product/part assumes the remaining warranty of the original product or ninety (90) days from the date of replacement or repair, whichever provides longer coverage. When a product or part is exchanged, any replacement item becomes customer's property and the replaced item becomes RS's property. When a refund is given, the defect product becomes RS's property.

It is the sole and exclusive responsibility of Customer to determine the suitability of any and all products for the Customer's use. **THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF RANCH SYSTEMS BEYOND THE WARRANTY SET FORTH IN THIS SECTION ABOVE. THIS EXCLUSION MEANS THERE IS NO IMPLIED WARRANTY OF MERCHANTABILITY AND NO IMPLIED WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE. THIS EXCLUSION ALSO MEANS THAT RANCH SYSTEMS GRANTS NO IMPLIED WARRANTY ARISING BY USAGE OF TRADE, COURSE OF DEALING OR COURSE OF PERFORMANCE, AND NONE SHALL ARISE OUT OF ANY SALE UNDER THIS AGREEMENT OR OUT OF EITHER PARTIES' CONDUCT.**

Obtaining Warranty Service.

To obtain warranty service customer must deliver the product to the nearest wholly-owned Ranch Systems facility at customer's expense. Ranch Systems will return repaired product at Ranch Systems' expense by common carrier – such as UPS or Fedex - to any return address within the United States as directed by customer. For return service outside the United States, customer is responsible for costs in excess of the common carrier cost to ship to nearest major city inside the United States.

Limited Liability.

Ranch Systems shall not be liable for direct, indirect, incidental or consequential damages, including, without limitation, damages or harm to business, lost profits or lost revenues (however arising, including negligence), whether or not Ranch Systems has been advised of the possibility of such damages. Ranch Systems shall not be liable for any damage that Customer may suffer arising out of the use, or inability to use, the services or products provided hereunder. The liability of Ranch Systems for any claim by any party arising out of or in connection with the services or products provided hereunder shall not exceed the amount paid to Ranch Systems by Customer with respect to the sale of the specific product or services cited in such claim. Customer shall indemnify and hold Ranch Systems harmless from and against any and all liabilities, losses, damages, costs, expenses awarded against Customer in connection with any third party claim, action, or right of action, at law or in equity, arising out of bodily injury, property damage, or any other damage or injury caused by Customers use of the Ranch Systems Solution.

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ABOUT THIS GUIDE AND OTHER RESOURCES

This guide is intended to get you started as soon as possible. However, it is not a comprehensive description of the system. Other resources include:

- ✔ The RanchMaster User Manual. This comprehensive document is available as PDF file through the **www.ranchsystems.com** website.

- ✔ Online help – each page in the online software contains help information right on the page in the upper left hand corner, indicated by the blue question mark icon.

- ✔ Ranch Systems staff – we are available to respond to your questions directly as time permits. The best way to reach us and be sure of a comprehensive reply is to use email: **support@ranchsystems.com.**

Warning: Be sure to exercise safety procedures for machines and equipment to protect yourself from injury that could otherwise be avoided. Always wear eye protection, and gloves while working with tools.

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SYSTEM COMPONENTS

Compatible components in the RanchMaster Family which may be a part of your order.

	Weather Station	A package of a Base Station and the most common weather sensors.
	Base Station	A triple band wireless networking node. This is the main online link for all nodes.
	RM210	4 Analog Sensor Ports, 2 Digital Counting Ports, 2 Serial Ports, 4 Relay Ports (Optional).
	Mesh Node	A two-way communications node
	RS210	3 Analog Sensor Ports, 1 Analog or Digital Counting Port, 1 Analog or Digital BUS Port, 2 Serial Ports, 3 Relay Ports (Optional).
	RSRF Node	Transmit only node.
	RS100	1 Analog Sensor Port, 1 Analog or Digital BUS Port

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Compatible Sensors for RanchMaster
Equipment which may be a part of your order.

	Micro Probe Analog Temperature	Connects to an Analog Sensor Port
	Analog Temperature	Connects to an Analog Sensor Port
	Humidity	Connects to an Analog Sensor Port
	Wind Speed and Direction	Connects to a WSWD Port, or two Analog Sensor Ports
	Rain Gauge	Connects to a Digital Counter Port
	Pyranometer	Connects to an Analog Sensor Port

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INSTALLING A WEATHER STATION

A Base Station is intended to mount to a standard 3” Pipe. Typically this is a 3” Black ABS Pipe, 10 feet long, available at most hardware stores or building supplies. For installations that need a height taller than 10 feet, a telespar antenna mast or 3” Steel pipe is recommended. This is usually a 20-30 foot pipe cast into concrete 5 feet into the ground.

A detailed explanation of where to install the Station is in Section 5.

Illustration 1: Weather Station mounted to 35' Telespar Antenna Mast

Illustration 2: Standard Weather Station Installed on 10' x3” ABS Pipe

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Unpack and Verify Components

1. Verify that all equipment has been received intact and that there is no damage to equipment, note if any damage to the shipping boxes.

2. Check that all items on packaging list have been received per sales order, and that there nothing is missing. This is a good time to get aquainted with the components with your order. Be sure to read all installation and safety guidelines supplied with the equipment.

If you think that you are missing any components, please contact Ranch Systems support at support@ranchsystems.com

IMPORTANT

It is a good idea to follow the verification steps in the following sections first, in order, before installing. Any number of problems could have happened in shipping. You may also start the installation by skipping to Section 5. You will be referred to the verification steps as you install. However, it is much more difficult to diagnose problems when everything is mounted in the field.

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2. Verify that Base Station powers up

The Base Station ships with the main battery disconnected. The battery gets connected when either a solar panel or a wall charger is inserted.

If you have ordered the wall charger, and you do not plan to deploy the Base Station immediately, it is a good idea to start by plugging in the wall charger at this point and charging the Base Station for 24 hours.

Alternatively, you may insert the solar panel immediately, which will prompt the Base Station to start – even if the solar panel is not exposed to sun. This is because the solar panel plug itself serves to connect the internal battery, and acts like a power switch for the unit. With the Solar Panel plug inserted into port 1 the unit will turn on.

After inserting the power plug, the base station will beep several times. It will take a few moments after inserting the plug to hear the beeps. With the base station open, the light in the lower right hand corner will begin to flash about 2-5 seconds after power is applied. The other lights will begin to blink indicating functionality of different components for instance modem and mesh network connectivity.

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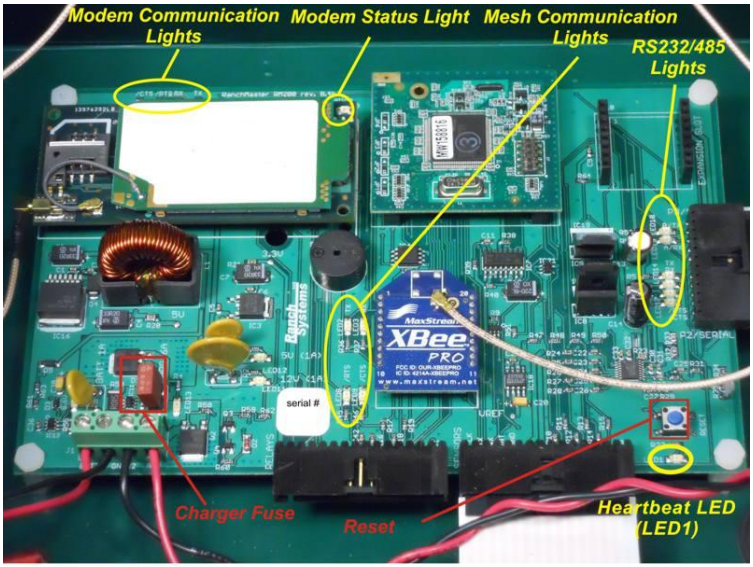

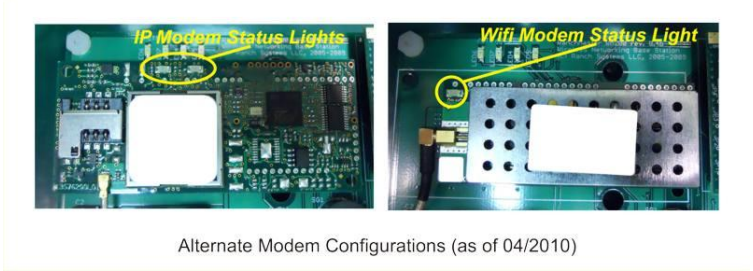

Illustration 3: RM210 Mainboard layout with alternate modem configurations

If the Base Station does not start up, please contact Ranch Systems support at support@ranchsystems.com

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3. Verify that Base Station connects to Server

Make sure that the Base Station is placed somewhere with adequate cellular connection. Ranch Systems uses GSM, CDMA cellular signal, or WiFi depending on what you ordered.

Certain types of cell phones can be used to gauge if there is signal:

- Phones from Cingular, Edge Wireless, and T-Mobile are typically GSM.
- Phones from Sprint or Verizon are typically CDMA.
- Nextel is **not** typically GSM or CDMA.

Once the Base Station is turned on, and adequate signal is available, it should begin to synchronize with the Ranch Systems server. Give it a few minutes to get connectivity and synchronize before starting to troubleshoot.

When first powered up, the time of the unit will not be correct. With a successful Internet connection, the system will discover this and the time will be adjusted, and the unit will reset automatically. You will hear the same series of initial beeps again as this happens.

At this point the Base Station is running and logging receiving sensor information from nearby nodes. All the programming of functionality is done in the Internet software.

You should now check online to see if recent data is present. It may take up to half an hour for the first set of data to show up with the correct time.

If the Base Station does not start up, please contact Ranch Systems support at support@ranchsystems.com

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4. Verify sensor data in the on-line application

Whether you checked the data arriving to the Base Station, or not, the most important test is to verify that sensor data is arriving correctly into the on-line application.

Go to www.ranchsystems.com and click the “My Account” link on the upper left side.

Log in using three pieces of information:

- The Property ID. This is a short ID describing the property where a particular Base Station and node will be deployed. Several users may have access to any given property.
- User ID. This is an ID of a particular user. A user may have access to multiple properties.
- Password. This is the user-specific password.

You will receive an email with this information from Ranch Systems before you receive your system. If not, contact support at support@ranchsystems.com.

Now you should see a map with your Base Station and nodes clearly visible as little green icons. Try clicking on any of them, and you'll see a a graph of all the sensor data associated with that station or node (even system data, like battery levels).

You will also see specific sensors listed below the green icons. These are the sensors that have been specifically assigned to a zone or block. By default all the external sensors are assigned to a default block called “Default” - indicated on the map by a green, square box. Try clicking anywhere inside this box, **but** not on a node or sensor icon. You will see a zone/block graph, showing all the sensors assigned to this block (irrespective of which node

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they are attached to).

You can also try clicking on a specific sensor icon. This will produce a graph of only that sensor's data.

Click through the various nodes and sensors, getting familiar with the system. If some data seems to be missing, contact Ranch Systems support at support@ranchsystems.com.

Once you have deployed the hardware, you will want to do the following:

1. Upload an overview image of your particular property, such as an aerial photo or map (using Zone Definitions screen)
2. Define each of your irrigation blocks or zones (using Zone Definitions screen)
3. Attach specific nodes and sensor to blocks (using Sensor Assignment screen)
4. Place nodes and sensors on the map (using Sensor Assignment screen)

Note that you can assign same sensor to several zones, and it is often useful to create “virtual” zones that combine sensors in different, non-geographic ways. You can even draw these virtual zones on your map as little “buttons” for easy access.

Please read the software section in this manual for more information regarding setting up the online software, if you have any questions please contact Ranch Systems support at support@ranchsystems.com

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Installation of Base Station

Selection of the site for the Base Station is essential for good performance of the RanchMaster installation. It should generally be placed at the highest point in the topographical area where it has a good line-of-sight to each deployed sensor node. If you ordered a solar panel, good southern exposure is also necessary for charging the unit (out of the shade of trees or buildings).

Also, keep in mind where you might want to deploy nodes in the future. Planning now for a development in the future can save time moving the equipment for a better location.

For RS-100 Nodes (or RSRF Nodes), the maximum distance line-of-sight cannot generally exceed 1/3 mile, and should preferably be less. If your vineyard is flat, the distance will generally have to be less as the line-of-sight is subject to “ground interference” - especially as foliage increases during the season.

For RS-210 Nodes (or Mesh Nodes), the same considerations apply, although the line-of-sight distance can be up to 1 mile with 2.4 Ghz, and up to 2.5 miles with 900mhz.

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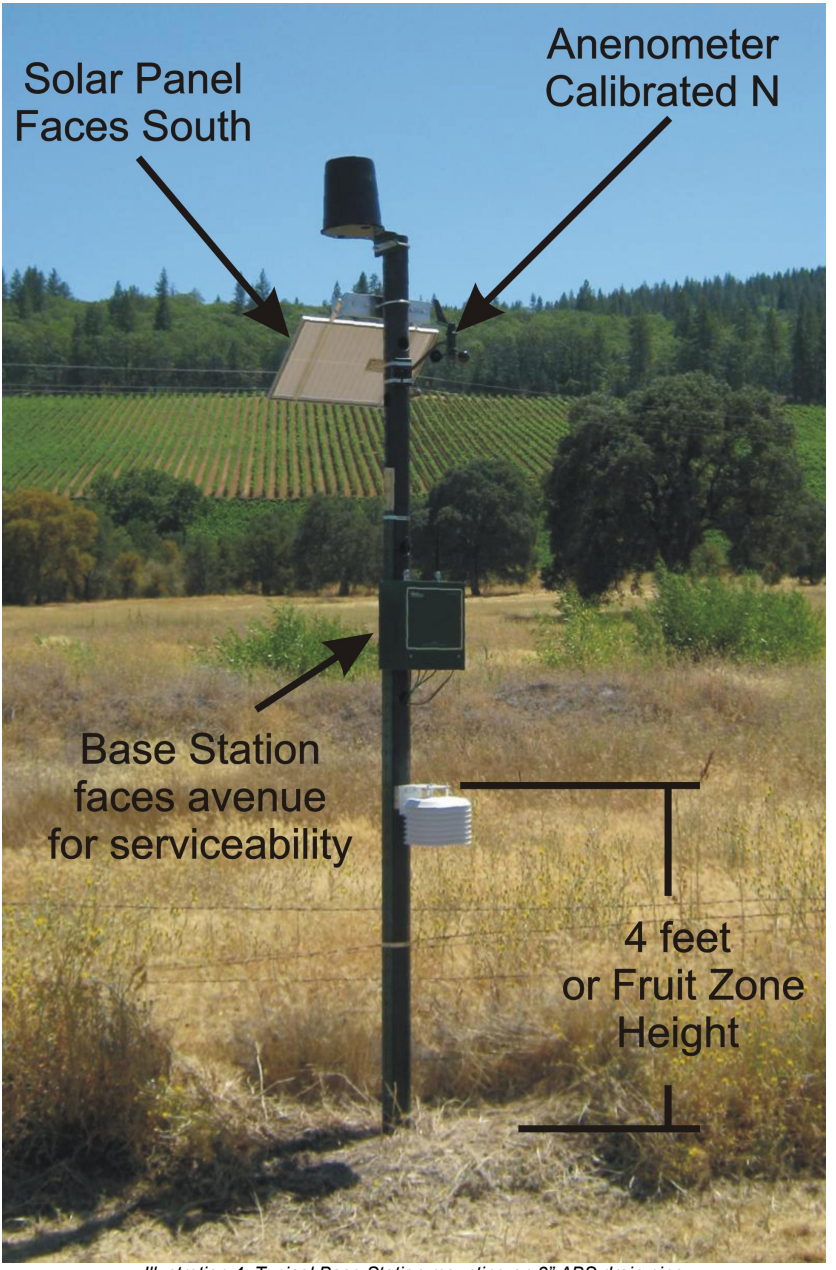

Illustration 4: Typical Base Station mounting on 3" ABS drain pipe

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The Base Station comes supplied with a mounting bracket assembly with metal bands that will fit around a variety of posts, both round and square. The ideal size of post is 3”, and very often a 3” Non-perforated ABS drainpipe is used, which can be secured to another post, such as a trellis end post or eight foot t-post. However, any tall, sturdy wooden pole, ABS, PVC or steel pipe will work. The pipe should be straight, and plumb.

Note, that all antennas on top of Base Station should be free of obstructions, and as high from the ground as feasible. It is usually preferred that the unit is roughly 5 to 6 feet from the ground. However, the higher the Base Station the more likely range will increase to the nodes.

An extension antenna kit is available for installations requiring higher elevation antennas to gain line-of-sight to outlying areas. Please contact Ranch Systems Sales for more information regarding this product and installation costs.

Illustration 5: Base station with Antenna extension mounted on 30' Telespar Mast

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If you use a 3” ABS pipe, and you are installing the Weather Station Package, you might consider drilling 1.5” holes at various heights along the pipe to accommodate

Illustration 6: Drilling base station pole with hole locations marked on 3/4” PVC

running wires inside the pipe which both protects cables and leaves a neat appearance when the cables are tucked away inside the pipe, minimizing damage potential to cables.

Typical base station pole: hole locations (10'x3” ABS Pipe):

- Measure from bottom of pole and mark with tape or otherwise:
  1. 36”, 60”, 80”, 96”, 104”, 112”
  2. At 36” drill 1½” Hole
  3. Rotate the pipe 90 degrees clockwise and drill on the 60”, 80” and 104” marks, keeping the pipe fixed so holes are on one side of pipe
  4. Rotate 45 degrees clockwise. Drill at 96”
  5. Rotate 90 degrees clock wise. Drill at 112”

- 36”=Radiation shield; 60-80”=Base station; 96-112”=Solar Panel, Anenometer, Pyranometer (placement is installation-site dependent)

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7. Connect Sensors to Weather Station

You will find the following connectors on the bottom of your Base Station:

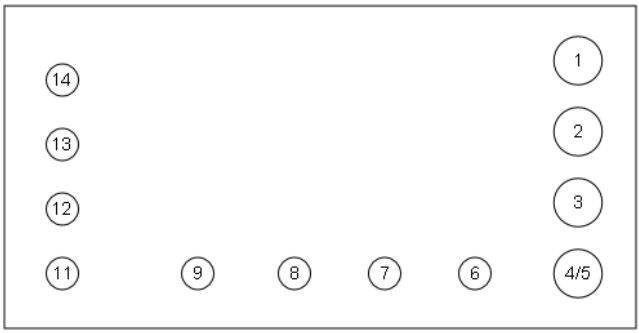

Illustration 7: Base Station Connectors

1) Solar Panel or AC Adapter	6) Temperature (TP)	11) Relay 1
2) RS232 Serial	7) Relative Humidity (RH)	12) Relay 2
3) RS485 Serial	8) Rain Gauge (RG)	13) Relay 3
4/5) Wind Speed and Direction (WS/WD)	9) Pyranometer (PY); or other analog sensor	14) Relay 4

When using a drilled pipe, be sure to clean the hole of any burrs or sharp edges that may cut the cable, then run each cable through the pipe *before* connecting. When using a solid pipe or pole, connect all cables first, then secure the cables to the pole or pipe with zip ties.

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6. Solar Panel Assembly

If you ordered the solar panel from Ranch Systems, you typically also ordered the pole mounting hardware. These mount kits vary slightly by type of panel, but generally look like the picture below.

Illustration 8: Solar Panel Assembly

The panel assembly consists of 4 main parts:

1. Two Aluminum Cross-members (1/2” x 18” angle pieces)
2. Mounting Bracket
3. Hardware Kit (two bags)
4. Solar Panel

If your type of panel assembly is shipped in parts, you need to first assemble these parts before placing on the pole:

1. Place the square nuts into the slots on the longer side of the solar panel as shown below.

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Illustration 9: Nut and Screw Installation

2. Place the aluminum angle pieces over the nuts and align the hole with the nuts. Install all screws loose enough for the aluminum cross-member to move.

Illustration 10: Nut and Screw Installation

3. Place the mounting bracket inside the two angle pieces, and install the four screws with lock-nuts provided, keeping them loose enough for the pieces to rotate.

Illustration 11: Nut and Screw Installation

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Illustration 12: Assembled Solar Panel, (exposure side facing down)

Next, mount the assembled solar panel to the actual base station pole and secure the panel to the pole using the included U-bolt and flat bracket. Finish by turning the panel to a straight south exposure. The bracket should be made for at an appropriate angle to the sun for your location, typically 45 degrees for California.

If using a drilled ABS Pipe, gently pull the cable down through the pipe and out an adjacent hole just below the Base Station.

Plug the solar panel cable into the Base Station: Port 1 (See Illustration 5 in the next section), this will cause the Base Station to start-up (even without sunlight).

Now follow the Verification Steps in Sections 2 & 3 to assure you have a reliable connection to the Ranch Systems servers.

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8. Assembling Radiation Shield

1. The Radiation Shield will have the Temperature and Relative Humidity sensors already installed inside the shield. Attach the shield with sensors to the pipe or pole at the desired height, typically fruit zone height. First attach the mounting bracket to the shield with hardware provided as shown below.

2. Use the stainless steel bands or u-bolts provided to mount to the shield to the pipe. For bands slide the band between the channel and bracket, this will be secured to the pipe that the unit is mounted to typically adjacent to the fruit height for microclimate or 48” for mesoclimate measurements

Illustration 13: Attach bolts and mounting bracket

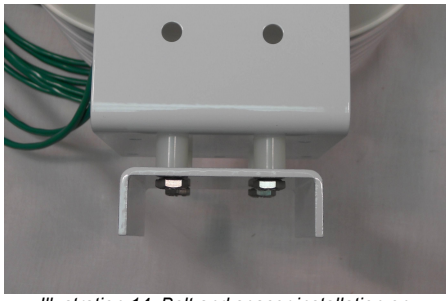

Illustration 14: Bolt and spacer installation on Radiation Shield

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9. Assembling Rain Gauge

A steel plate with 6 screw holes is provided for mounting the black rain gauge to a pole. To assemble:

1. Thread the four screws into the holes from the underside of the bracket.
2. Carefully remove black rain gauge bucket by twisting counter-clockwise and lifting away from the base, once the bucket is disengaged.
3. Align the notch at the bottom of the black rain gauge to the right-angle on the plate, and insert the screws into the rain gauge. Place the included nuts over the screws and tighten the screws only (so as to tighten the nut without a wrench or twisting) to secure the gauge to the plate. See illustration 15 for detail

Note: Extra screws and nuts are provided for your convenience.

Illustration 15: Screw pattern for underside of RG Bracket

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9. Testing the rain gauge

1. After turning on the base station and waiting 30 minutes for a time synchronization
2. Access the tipping bucket of your rain gauge – this usually means you twist the whole 'hood' and remove it. Otherwise follow the instructions with your gauge.
3. Open the Rain Gauge and remove a shipping zip tie on the moving tipping mechanism inside.
4. CAREFULLY cut the yellow zip tie inside with wire cutters. It can be very close to the wires, and the mechanism is sensitive. Do not push or pull on the tie with a knife or blade, this can damage the mechanism and void the warranty.
5. Now manually tip the silver cups inside the gauge 5 times. 5 is usually good and easy to remember, this would show up online as 0.05 inches of rain.
6. Replace the bucket on the gauge, exercise caution to avoid pinching the sensor cable. There is a notch in the plastic base that receives the cable, and protects from the locking of the bucket, make sure the cable is not twisted or out of alignment inside the notch as this can damage the cable.

Illustration 16: Be sure cable is not pinched when securing bucket to bracket

7. At this point your station is ready to use, and you should see data entering the web application within 15 - 30 minutes.
8. A U-Bolt is provided for a 3” Pipe, this should be about 2 inches from the top of the pipe, leaving the

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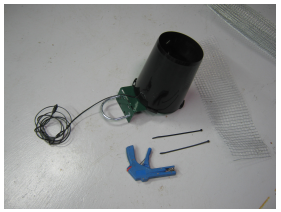
top of the rain gauge well above the pipe.

Note: In some locations aviary defense is needed to deter droppings and ultimately the clogging of the rain gauge. However, we recommend researching local laws before attempting to put spikes on the gauge, as other methods such as higher perch areas, predatory birds, and more frequent cleaning are suitable options. Bird Spike Installation kits are available from Ranch Systems.



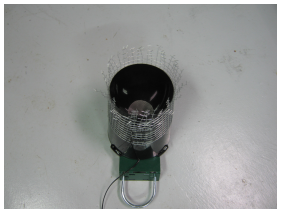


Illustration 17: Bird Spike Kit

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10. Configuration of wind direction

1. Assemble the Wind Speed and Direction sensors with the hardware, per the manufacturers directions included in the box.
2. Using the bands or u-bolts provided in the box, mount the sensor to the pipe.
3. Point the sensor arm in a direction so as to encounter the prevailing winds.
4. Connect the sensor to the unit in the appropriate port.

Wind direction is the only sensor that needs specific configuration. Note: You will need a compass or know exactly which direction North is to do the following:

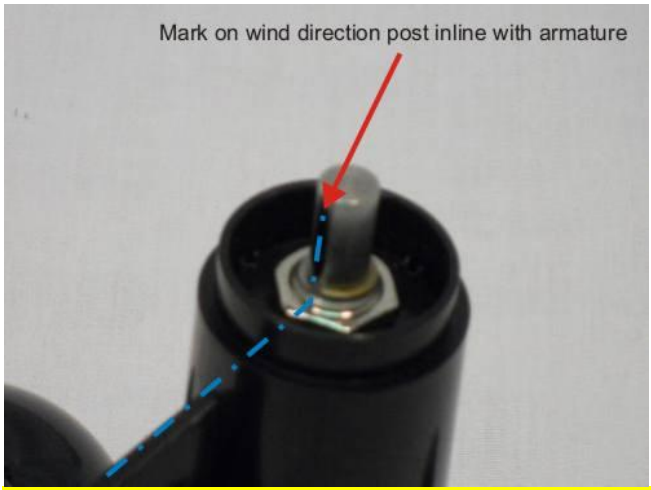

Illustration 18: The mark on the spindle or wind direction axle will align with the armature.

1. After the Anemometer has been assembled and mounted to the pole, remove the weather vane (wind direction pointer). The black line on the spindle needs to be aligned with the support arm. This is the calibration mark for the sensor.
2. Place the weather vane (wind direction pointer) on the upper spindle pointing the vane exactly North. Be careful not to move the spindle as you sight out

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North. Finish by tightening the set screw with the hex key provided in the hardware bag.

Illustration 19: Installation on a 3/4" EMT Conduit for an RS-210

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INSTALLING SENSOR NODES

The key to a good node installation is achieving a clear line-of-sight connection to the base station, ensuring good data connectivity at all times. Nodes should be placed well above maximum crop canopy height.

The RS100 and RS210 nodes have been manufactured to be installed with easily available materials such as: 1” or ¾” **White PVC pipe** or ¾” **EMT Conduit pipe**, **UV resistant zip-ties** and **Stainless Steel Hose Clamps**. These types of pipes are already widely used so the pipe, fittings and tools are readily available at low cost. The result is faster and less expensive installations. They are usually purchased in 10' lengths, which makes a good height for most locations, as long as overhead farming and picking equipment will not be a factor in the installations.

Illustration 20: RS-210 Micro-climate Weather Station

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Often we recommend attaching the node to the installation pipe before attaching to the line post, as a small bull ladder is required to reach up to the top of a 10 foot pipe once installed.

As with the base station, ensure that the each units antennas are free of obstructions as well as potential future obstruction from growing foliage (note: consider a clearance of at least ***two feet minimum***).

Notes to Consider:

- Leave a Service Loop at the end of cables and anywhere a cable is exposed and likely to moved or pulled, so as to reduce wear on connectors and reduce chance of a rip-out of connector.
- Placing sensors out of path of danger from heavy machines, pruners, paddles, discs, etc.
- Collapsible mounting poles to lower equipment while overhead mechanized equipment passes through.
- Protecting sensor cables with PVC pipes and proper fittings to reduce chance of cuts and pulled out cables

Follow steps 1 and 2 for each node you received. Then follow step 3 to verify all nodes after they have had 15-30 minutes to report.

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1. Installing an RS-210 Node in the field

RS210 Nodes are shipped with an integrated mounting assembly which holds both the solar panel in place, as well as a ¾" EMT Conduit connector. All you need is to attach a ¾" EMT Conduit pipe to a line post in the vineyard (using metal bands) and hand-tighten the nut with the RS210 node on top.

Illustration 21: RS210 Node

Illustration 23: RS210 Node Assembly ready to deploy on 3/4" EMT Conduit pipe.

Illustration 22: RS210 Deployed on 10' Conduit pipe.

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1. Installing an RS-100 Node in the field

RS100 Nodes are attached to a ¾” four-way PVC tee using two UV/weather resistant tie wraps

Illustration 24: RS100 Sensor Node Assembly

Illustration 25: RS100 Deployed on 10' PVC pipe

passed through their mounting flanges. The assembly is then easily slipped onto the pipe in the field.

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2. Connect Sensors to Sensor Node

Both the RS100 and RS210 nodes accept mostly the same types of sensors. If a Radiation Shield is used on any sensor, make the sensors are mounted in the shield by follow the section “INSTALLING RADIATION SHIELD” before you connect them to the node.

RS100 Nodes come completely ready, meaning they are already transmitting data, and there is nothing to do but plug in the sensors.

RS210 Nodes have an internal battery and an attached solar panel. However, they ship with the solar panel connector disconnected, which leaves the internal battery disconnected, and the node is not transmitting. To activate an RS210 node, simply plug in the solar panel. Even without sunlight, the RS210 will now start communicating with the base station.

Illustration 26: RS100 Node

Illustration 27: RS210 Node

For both types of nodes, you must make sure the right sensors are plugged into the right ports.

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RS100 Nodes - You can see what sensor type is expected in the two white squares on the front label of the nodes.

RS210 Nodes - These are slightly more dynamic, due the higher level of programmability. You may have received one of these types of RS210 nodes:

- **RS210-S** has 6 sensor ports.
- **RS210-PRO** has 6 sensor ports and 3 relay ports.

  The initial programming of these ports will be listed on a card shipped with the unit, and should be available after logging into the RanchSystems website. If you have not received such a card, please contact support@ranchsystems.com.

You should have received sensors to match your nodes, and at this point you can go ahead and plug them into their respective ports.

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The most common sensor types are represented as follows:

TP	Temperature
HM	Relative Humidity
WS	Wind speed
UV	UV radiation
PY	Pyranometer (solar radiation)
FL	Water flow (turbine sensor)
PS	Pressure (usually water pressure)
WL	Water Level (either in-pipe or submersible)

If you don't seem to have a matching set of nodes and sensors, please contact Ranch Systems support at support@ranchsystems.com

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3. Verify that Nodes are transmitting to Base Station

If you decided to plug the sensor into the nodes and do an indoor “bench test”, this is a good time to go and make a fresh pot of coffee, drive around the vineyard or check email. It will take a little while for a meaningful set of data to “percolate” through the system, so rather than wait around for the nodes to show up online, let the system sit for a few hours, and then go to the next step.

To check which nodes have reported to the base station, you will need to go online. See Section 4 of “INSTALLING A WEATHER STATION”.

Note that nodes have more ports than the physical ports. Here is an overview of all the 'logical' ports you might see:

For RS100 nodes:

0	Reports the internal temperature of the node
1	Reports data from the external sensor port 1
2	Reports data from the external sensor port 2
3	Reports the voltage level of the internal 3.5V lithium battery
4	Reports either the voltage level of the internal 5V voltage generator (for sensor excitation) or the internal humidity of the node (for detecting malfunctions) depending on the hardware revision.
9	A port used for internal reporting of system configuration to the base station

For RS210 nodes:

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0 Reports the internal temperature of the node

1 Reports data from the external sensor port 1

2 Reports data from the external sensor port 2

3 Reports data from the external sensor port 3

4 Reports data from the external sensor port 4

5 Reports data from the external sensor port 5

6 Reports data from the external sensor port 6

7 Reports status of relay 1

8 Reports status of relay 2

9 Reports status of relay 3

10 A port used for internal reporting of system configuration to the base station

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INSTALLING OTHER SENSORS AND EQUIPMENT

Installing Pyranometer

A Pyranometer measures the radiation from the sun in watts per meter square. It is used specifically to gather evapotranspiration (ETO) readings.

The sensor must be directed by turning the bracket or turning the sensor itself so that the wire from the black dome sensor faces north. A leveling plate is provided to aid in achieving more accurate results, Use the Hex key provided to adjust the height of the plate if necessary.

A mounting bracket is provided to attach to the base station pole or node pole.

Illustration 28: Pyranometer Assembly

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Installation of inline water flow meters

Illustration 29: Irrigation Monitoring with inline rotary flowmeter and Aquaspy soil moisture sensor

Installation into various sizes of tubing or pipe is possible with a variety of fittings, however the most important factor to consider is flow rate. Please consult with the table below to best understand the flow rate for your meter.

Note: Restricted flow rates, are achieved with the plastic insert provided with the flow meter, and can alter the water pressure, can clog, and are not as accurate as unregulated flow, be sure to check flow often or setup feedback alerts (covered in the user manual: Online Software).

Size Inlet	**Minimum *Std.* Flow Rate**	**Minimum *Restricted* Flow Rate**
.25”	.5-1.0 GPM/30-60GPH	.1-.3GPM/.6-18GPH
.75”		N/A
1”		N/A

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- Important flow meter installation considerations:
    1. Flow rate across the sensor, is dependent on the amount of drippers or otherwise that are 'down tube' from the meter.
    2. The viewing window should be facing north if possible, and covered with a plastic opaque plate (to reduce growth inside tubing).
    3. Consider protecting the sensor cable with PVC piping to the sensor, make sure that the pipe is secured in 2-3 places so that it doesn't move freely.
    4. Consider adding service loops nearby the sensor where a few loops around the hand and securing to a nearby post or pipe with zip ties allows slack in the event that service is needed to be performed on the sensor or poly tube.

Illustration 30: Flowmeter with locking poly tube fitting.

A locking fitting like the above pictured assembly is ideal when poly line is dropped from the wire for servicing, and also to clear the meter itself.

Illustration 31: Flow meter poly tube installation kit; Assembly exploded view

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Illustration 32: Flow meter poly tube installation kit; Assembled

Illustration 33: Flow meter barb fitting installation kit, requires hose clamps or otherwise to secure pipe, . 375Z' O.D.

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Installing BATT 55 UPG

Battery upgrades for base stations allow for longer running time in severe weather conditions.

Note: Take consideration of the additional weight of the 55 Amp hour upgrade (60+ lbs), additional support or braces may be needed.

Illustration 34: Batt55 UPG Enclosure

Find a suitable location near the bottom of the pole to mount the enclosure. Hint: it may be easier to mount the enclosure with the battery removed, to do so simply unscrew front cover and remove battery connectors being sure to replace the cables to the original locations blue=black(-) red=red(+).

1. Remove the 1/2” knockout plug on the bottom side of the base station before mounting to the pole, it is necessary to remove the base station to remove the knockout. Place the unit on a piece of flat wood, a blow from a hammer to a flat head screwdriver pressed directly onto the knockout on the bottom should be enough to dislodge the plug. Remove completely with pliers and be sure to clean any remaining material from the entrance to the

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hole.

2. Route battery cable through pole by either drilling a new hole (being sure not to drill through existing sensor wires, etc), or pulling cable through nearest existing hole in the base station pole. Remove nut from liquid tight connector/strain relief, and feed cable into base station. Replace nut on connector and tighten well to ensure snug grip on cable.
3. Connect wires inside base station box matching the wire colors inside the box leading to the battery terminals.

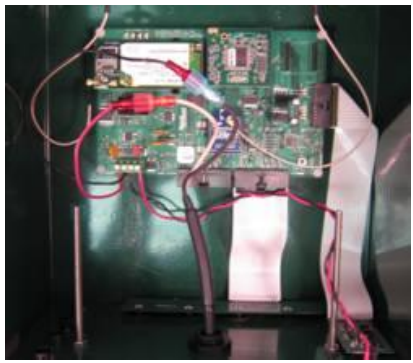

Illustration 35: Inside base station with battery cables from batt55 connecting to inside connectors.

4. After checking to ensure cables are correctly matched with like cables. Reinsert the solar panel plug into port 1 and ensure that the unit synchronizes with the server.

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Installing Aquaspy Probes

AquaSpy Sensor is the most economical solution for reading moisture at a single depth.

AquaSpy Below Ground Probes come in 20, 40 and 60 inch lengths. The first sensor is 2 inches below the top of the probe. Sensors are spaced every 4 inches down the probe, which has 5, 10 and 15 sensors respectively.

AquaSpy Above Ground Probes come in 40 and 60 inch lengths. The first sensor is 4 inches below the bottom of the blue cap. Sensors are spaced every 4 inches down the probe, which has 10 and 15 sensors respectively.

Installation Site Considerations

Where possible, soil type should be representative of the general field conditions or site specific conditions which represent the zone or plot as a whole. Plant type and growth stage should be representative of this zone. The probe is not installed where irrigation overlaps or at its edge. Perform a site survey to confirm that the chosen telemetry solution is effective at the installation site.

Select an installation site where the probe will be

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accessible but will not be subject to heavy traffic and has adequate security. Install probes in the plant line and root zone of representative plants, and between the irrigation source and the reference plants.

For drip irrigation systems install the probe within the root zone, typically 4 – 5 inches from the drip.

Slurry Installation: AquaSpy probes are installed into a thick slurry mix. The slurry uses soil from the installation site where possible. If that soil will not make thick slurry Kaolin is recommended instead.
Filling gaps between the probe and soil, slurry is displaced around the probe during probe installation.

Direct Installation: Because AquaSpy Soil Moisture Probes contain precision electronics hitting a probe or cuts in the cable void its warranty.

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During the installation of the probe :

- Do not compact the soil.
- Do not damage the reference plants near the probe.

1. Remove loose material (ie. Rocks) around the location for the hole.

2. Use an auger to dig a hole slightly larger than the probe. Using water with the auger makes digging easier and minimizes damage to the soil structure.

3. Make the hole about 6 inches deeper than the probe length.

4. Add sieved soil or Kaolin to water, making a thick slurry mix. Make sure there are no lumps, yet it should be “pourable”. Similar to Pancake Batter.

5. Fill the hole half way with slurry.

6. Push the probe firmly into the hole with a gentle circular motion, displacing slurry around all sides of the hole as the probe reaches its depth.

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7. If slurry is not displaced around all sides of the hole, withdraw the probe, insert more slurry and install the probe again.

8. Clear excess slurry away from the probe.

9. Neatly run wire to Node or Base Station, plug in to RS485 Port.
   Note: Consider protecting cables with PVC pipe to the sensor.

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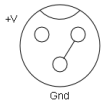
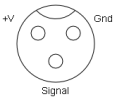
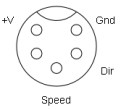
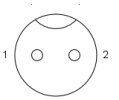
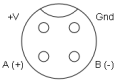
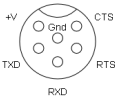
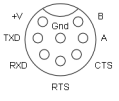
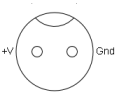
WIRING DIAGRAMS

Diagrams are for the **Plugs** on the end of wires, from the “inside” or “wiring side” of the connector. This is also the same view of the **Sockets** mounted on devices as viewed from “outside” the device.

Pins on Plug (Cable end Connector)	Description	Manufacturer and Part Number for plugs
	Solar Panel, AC Adapter. Small Size for 1 Watt Supply, +V >= 12 VDC Large Size for 10 Watt Supply, +V >= 14.4 VDC Two GND Pins are connected in the plug to act as the power switch	RM200 Series SwitchCraft # EN3C3F RS200 Series Conxall # 16282-3SG-315
	Analog Sensor, Digital Counter, Digital BUS +V = 5.0 VDC Analog Signal = 0 – 5 VDC Counter Signal = 5 VDC Pulse BUS Signal = 1-Wire® Bus	Conxall # 16282-3PG-315
	Wind Speed and Direction +V = 5.0 VDC Speed = Digital Counter Dir = Analog Sensor	Conxall # 6282-5PG-3DC
	Relays Power Output: 1 = +V ; 2 = GND DC Latching : 1 = -V ; 2 = +V Switch N.O. : 1,2 = Contact Closure	Conxall # 16282-2SG-315
	RS485 Serial +V = 9.0 VDC	Conxall # 6282-4PG-3DC
	RS232 Serial +V = 9.0 VDC	Conxall # 6282-6SG-3DC
	RS485/RS232 Serial +V = 9.0 VDC	Conxall # 6282-8SG-3DC
	Power Output +V = 12.0 VDC	Conxall # 16282-2PG-315

Plugs can be ordered from RanchSystems, or online from Digikey or Allied Electronics.

Note that the last 3 digits of Conxall numbers refer to grommet size, which may be substituted.

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FURTHER HELP

This guide should have given you the tools needed to get started, as well as an overview of the various features available to you.
For detailed help and instructions on the various features, please use the sidebar to access the desired feature, and then scroll to the bottom of the web page, where you will find additional instructions. Each time you click further into the application, the bottom of the page will show the relevant help information for that stage.
You can quickly identify the web page help texts by looking for the context help icon:

However at Ranch Systems we completely understand that you are likely to have questions and problems that go beyond what we have anticipated in our help texts, and we are always available to help you on the phone or by email:

Ranch Systems phone support: 415 884 2770.

Ranch Systems email support:
support@ranchsystems.com

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